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THE FIGWORTS OF OHIO.*

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The following study of the species of the Scrophulariaceæ of Ohio is based upon the material in the Ohio State Herbarium and upon personal collections. Although the Figworts have for some time been grouped more or less in agreement with their phylogeny, a special attempt has been made to bring the various groups into their natural sequences, proceeding in each case from the generalized to the more specialized species, according to the principles followed by Prof. John H. Schaffner, under whom the study was made, and to whom indebtedness is gratefully acknowledged.

The nomenclature follows that of Britton & Brown's Illustrated Flora, second edition. The later important work of F. W. Pennell on the Scrophulariaceæ has been carefully considered, and all changes of nomenclature advocated by him have been indicated. It was thought best, however, for the present, in order to facilitate easy reference, to retain the older names for the list as given in the Ohio Catalogue of Vascular Plants.

The keys are based upon the characters most evident at the time of blooming and apply only to the local flora.

SCROPHULARIACEÆ. Figwort Family.

Herbs, shrubs, or trees, with opposite or alternate, and usually simple leaves, without stipules, and with perfect, zygomorphic, mostly complete flowers, in clusters or in the axils of the leaves; flowers hypogynous, tetracyclic, pentamerous or the parts reduced; corolla sympetalous, nearly regular, or commonly more or less two-lipped, sometimes spurred or saccate; calyx persistent, with four or five united sepals. Andrecium with five, four, or two fertile stamens, united with the corolla, and alternate with its lobes; if less than five, com-

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monly with vestiges of the missing ones, didynamous or nearly equal; anthers with four microsporangia, sometimes confluent. Gynecium with two united carpels; ovulary usually bilocular; ovules mostly numerous, rarely few, borne on axile placentæ; style simple, stigma two-lobed; fruit mostly a septicidal or loculicidal capsule; seeds usually numerous and small, the testa reticulate, pitted, striate, ribbed, or nearly smooth.

SYNOPSIS OF THE GENERA.

- I. Stamens 5, (ours) all with fertile anthers; corolla more or less rotate; upper lip of corolla covering the lower in the bud; leaves alternate.
 VERBASCATÆ.
 VERBASCEÆ.
 1. *Verbascum*.
- II. Stamens 4 or 2, with fertile anthers, the fifth and sometimes the two lateral ones sterile or reduced to mere vestiges, or sometimes entirely absent; corolla usually tubular, sometimes more or less rotate.
 - A. Capsule opening by valves, either loculicidal or septicidal; corolla not spurred, sometimes gibbous or saccate, corolla usually without a palate in the throat, not with 2 sack-like lips.
 1. Upper lip or lobe of the corolla usually covering the lower in the bud; capsule usually septicidal. SCROPHULARIATÆ.
 - a. Fifth or sterile filament present, sometimes longer than the fertile, sometimes gland-like or scale-like; herbs; inflorescence usually compound, cymose, or if single, the peduncle mostly 2-bracteate. CHELONEÆ.
 2. *Penstemon*. 3. *Chelone*. 4. *Scrophularia*. 5. *Collinsia*.
 - b. Fifth stamen absent; trees with opposite leaves; inflorescence large panicle. PAULOWNIÆÆ.
 6. *Paulownia*.
 - c. Fifth stamen vestigial, small; herbs; flowers solitary in axils of bracts or leaves.
 - (a). Stamens 4, all anther-bearing and similar. MIMULÆÆ.
 7. *Mimulus*. 8. *Conoclinium*.
 - (b). Anther-bearing stamens 2, sometimes 2 additional filaments present. GRATIOLÆÆ.
 9. *Gratiola*. 10. *Ilysanthes*.
 2. Under lip or the lateral lobes of the corolla enfolding the upper in the bud; capsule commonly loculicidal. RHINANTHATÆ.
 - (1). Fertile stamens 4 or 2, not didynamous, or if so, their anthers not enclosed by the upper lip.
 - a. Stamens 4, all anther-bearing; corolla campanulate, salverform, or funnellform, scarcely 2-lipped.
 - (a). Ours with the leaves alternate; cavities of the anthers finally confluent at the top; not parasitic. DIGITALEÆÆ.
 11. *Digitalis*.
 - (b). Ours with the leaves, at least the lower, opposite; cavities of the anthers continuously distinct; plants commonly more or less parasitic. BUCHNERÆÆ.
 12. *Azela*. 13. *Dasystoma*. 14. *Agalinis*.
 15. *Otophylla*. 16. *Buchnera*.

- b. Fertile stamens only 2, rarely 4; corolla rotate, salverform, tubular, or none. VERONICEÆ.
 17. *Leptandra*. 18. *Veronica*. 19. *Synthyris*.
- (2). Fertile stamens 4, ascending, their anthers enclosed by the upper lip of the corolla.
 a. Cavities of the ovary with several to numerous ovules. EUPHRASIEÆ.
 20. *Pedicularis*. 21. *Castilleja*.
 b. Cavities of the ovary each with 1 or 2 ovules. 22. *Melampyrum*.
- B. Capsule usually opening by chinks or holes; corolla spurred or prominently saccate, or with a palate in the throat, or decidedly 2-lipped, the lips broad and sack-shaped; upper lip of the corolla covering the lower in the bud. ANTIRRHINATÆ.
1. Corolla tubular, prominently spurred or saccate, its throat usually closed by the palate; fertile stamens 4, a fifth, minute, vestigial stamen sometimes present. ANTIRRHINEÆ.
 23. *Antirrhinum*. 24. *Linaria*. 25. *Chaenorhinum*.
 26. *Kickxia*. 27. *Cymbalaria*.
 2. Corolla 2-lipped, sack-shaped, or the lower one large and slipper-shaped; stamens only 2. CALCEOLARIEÆ.
 28. *Calceolaria*.

KEY TO THE GENERA.

1. Anther-bearing stamens 5, the fifth smaller; corolla rotate; leaves alternate. *Verbascum*.
 1. Anther-bearing stamens 4 or 2.....2
 2. Anther-bearing stamens 4.....3
 2. Anther-bearing stamens 2.....23
 3. Corolla definitely spurred on the lower side.....4
 3. Corolla not spurred, although it may be gibbous or saccate.....7
 4. Flowers in terminal racemes; leaves narrow.....*Linaria*
 4. Flowers solitary in the axils.....5
 5. Leaves linear-spatulate to linear; flowers blue or bluish; throat of the corolla not closed by the palate.....*Chaenorhinum*
 5. Leaves broad, pinnately or palmately veined; the throat of the corolla nearly or quite closed by the palate; flowers yellowish, variegated, or lilac.....6
 6. Leaves pinnately-veined, entire.....*Kickxia*
 6. Leaves palmately-veined, coarsely toothed; creeping vine.....*Cymbalaria*
 7. Trees with large, heart-shaped, opposite, entire leaves; violet, panicle flowers.....*Paulownia*
 7. Herbs.....8
 8. Stamens not enclosed in the upper lip of the corolla, or apparently enclosed in the young condition, either included in the throat, exerted, or enfolded by the lower petal; upper lip of the corolla not galeate, or if slightly so, the vestigial stamen large.....9
 8. Stamens ascending under the upper lip of the corolla; the corolla decidedly 2-lipped, the upper lip galeate; the fifth stamen either minute or wanting..21
 9. Corolla decidedly saccate or gibbous on the lower side, with a prominent palate closing the throat; the fifth stamen very minute; leaves mostly alternate, entire; upper lip of the corolla covering the lower in the bud.....*Antirrhinum*
 9. Corolla tubular or only slightly gibbous, without a palate; frequently with the fifth, sterile stamen prominent.....10
 10. Fifth or sterile stamen prominent, either a filament, scale, or large gland; upper lip of the corolla covering the lower in the bud.....11
 10. Fifth stamen minute or wanting.....14

11. Corolla 2-cleft, the middle lobe of the lower lip conduplicate, enclosing the stamens and filiform style; odd sterile stamen gland-like..... *Collinsia*
11. Lower lip of the corolla not enclosing the stamens and style; the fifth stamen not gland-like, either a long filament or a scale..... 12
12. Fifth or sterile stamen reduced to a scale on the upper lip of the inflated corolla; stem 4-angled..... *Scrophularia*
12. Fifth or sterile stamen a filament, prominently bearded or glabrous; stem cylindrical or only slightly 4-sided..... 13
13. Corolla somewhat 2-lipped, the upper lip 2-lobed, not arched or keeled; sterile stamen nearly as long, or sometimes longer than the fertile ones, frequently prominently bearded; inflorescence thyrses, panicles, or racemes, sometimes spike-like at the tip..... *Penstemon*
13. Corolla decidedly 2-lipped, the upper lip arched, keeled in the middle and notched at the apex; sterile stamen shorter than the fertile ones; flowers in terminal and axillary dense spikes..... *Chelone*
14. Calyx prismatic; leaves opposite; stem square; flowers axillary.... *Mimulus*
14. Calyx not prismatic..... 15
15. Leaves alternate; flowers in one-sided racemes..... *Digitalis*
15. Leaves, at least the lowest, opposite..... 16
16. Sepals free nearly to the base, linear; upper lip of the corolla covering the lower in the bud, emarginate or 2-lobed; stamens included; annual, diffusely branched, pubescent herbs, with pinnately-parted leaves. *Conoclea*
16. Calyx with a considerable tube, campanulate or turbinate..... 17
17. Corolla salver-form, purple; flowers in a long, peduncled spike..... *Buchnera*
17. Corolla campanulate or funnel-form; flowers not in a long, peduncled spike. 18
18. Filaments glabrous or nearly so; leaves all, or some of them, auricled at the base; stamens didynamous, the anthers of the shorter stamens smaller..... *Otophylla*
18. Filaments wholly, or in part, pubescent or villous; leaves not auricled.... 19
19. Stamens nearly equal; calyx lobes as long as the tube; corolla yellow; lower leaves long-petioled and pinnately-parted..... *Afzelia*
19. Stamens unequal, strongly didynamous; calyx teeth shorter than the tube. 20
20. Anthers awned at the base; corolla yellow; leaves parted, lobed, or toothed, or if the upper are entire, then lanceolate or ovate-lanceolate.... *Dasystoma*
20. Anthers awnless; corolla purple, pink, or rarely white or yellowish; leaves narrowly linear or linear-lanceolate..... *A. galinis*
21. Leaves opposite, entire; ovules 2-4..... *Melampyrum*
21. Leaves alternate, or if opposite or whorled, then compound or lobed; ovules numerous..... 22
22. Anther-sacs dissimilar, the inner one pendulous by its apex; floral bracts brightly colored; leaves parallel-veined..... *Castilleja*
22. Anther-sacs similar and parallel; bracts of the inflorescence not brightly colored; leaves pinnately-veined..... *Pedicularis*
23. Corolla strongly 2-lipped, large and showy, the lower lip sack-shaped and broad; cultivated; sepals 5 or frequently the two lower more or less united..... *Calceolaria*
23. Corolla nearly regular, or if 2-lipped, the lips not sack-like..... 24
24. Corolla 2-3 lobed or none; leaves alternate; flowers in dense, terminal, elongated spikes or racemes..... *Synthyris*
24. Corolla 4-5 lobed; at least the lower leaves opposite or whorled..... 25
25. Calyx 4-lobed, rarely 5-lobed, the under lip or lobes of the corolla enfolding the upper in the bud; flowers solitary in the axils or in racemes or spike-like..... 26
25. Calyx 5-lobed; upper lip of the corolla covering the lower in the bud..... 27
26. Corolla tubular or salver-form, much longer than the calyx; stamens much exerted, nearly parallel; leaves opposite or verticillate, or both; tall herbs, 2-7 ft. high..... *Leptandra*
26. Corolla wheel-shaped, tube short; leaves usually opposite below and alternate above; stamens divergent; low or spreading herbs, 3-30 in. *Veronica*
27. Peduncles 2-bracteate at the summit; flowers yellow or whitish..... *Gratiola*
27. Peduncles not bracteate at the summit; flowers purplish..... *Ilysanthes*

1. **Verbáscum** (Tourn.) L. Mullen.

Mostly biennial, erect herbs, with alternate leaves, and prominent winter rosettes. Flowers pentamerous, in terminal spikes, racemes, or panicles. Corolla rotate; the fifth stamen anther-bearing; some or all of the stamen filaments pilose; ovules and seeds numerous.

1. Plants glabrous or sparingly glandular-pubescent; flowers racemose.
V. blattaria.
1. Plants densely woolly; flowers in dense spikes or spike-like racemes.
V. thapsus.

1. **Verbascum blattària** L. Moth Mullen.

Stem slender, erect, usually simple, glabrous or sparingly glandular-pubescent, 2-6 ft. high. Leaves oblong to ovate, or lanceolate, dentate or pinnatifid, the upper ones more or less clasping, $\frac{1}{2}$ -2 $\frac{1}{2}$ in. long, the basal ones sessile or short-petioled, up to 12 in. or more in length, forming rosettes, and in late autumn strongly geotropic, pressed close to earth, and with much anthocyan present. Corolla yellow or white, about 1 in. broad; filaments pilose, magenta. General and abundant in lawns, fields, and waste places. June-Nov. Naturalized from Europe. Flowers and leaves used as medicine.

2. **Verbascum thápsus** L. Great Mullen.

A stout, erect, usually simple biennial, 2-7 ft. high, densely woolly all over, and with large winter rosettes. Stem leaves thick, 4-12 in. long, prominently decurrent, the rosette leaves up to 18 in. long. Flowers yellow, $\frac{1}{2}$ -1 in. broad, sessile or nearly so, in dense spikes. Fields, waste places, and pastures, especially on hillsides. June-September. General and abundant. Naturalized from Europe.

2. **Penstèmon** Mitch. Beard-tongue.

Erect, perennial herbs with opposite leaves and large, usually showy flowers in terminal thyrses, panicles, or racemes. Corolla tubular, inflated, 2-lipped, the upper lip not arched. Stamens 5, included, 4 of them didynamous, anther-bearing, the fifth sterile, frequently bearded, nearly as long as or longer than the fertile ones. Seeds numerous.

1. Plants more or less glandular or pubescent; leaves dentate or serrate.....2.
1. Plants glabrous throughout and glaucous; leaves entire.....*P. grandiflorus*.
2. Corolla-tube not prominently enlarged; $\frac{1}{2}$ -1 $\frac{1}{4}$ in. long; leaves serrate or denticulate; thyrsus elongated and open, usually branched, panicle-like...3.
2. Corolla-tube much enlarged above, 2 in. long; thyrsus short; leaves dentate.
P. cobaea.
3. Only inflorescence or calyx pubescent, or if pubescent to the base, the upper leaves ovate-lanceolate and usually tapering from near the broad base; throat of corolla slightly bearded.....4.
3. Stems pubescent or puberulent nearly to the base; upper leaves usually narrowly-lanceolate; corolla bearded in the throat.....*P. hirsutus*.
4. Corolla-tube not gibbous above the point of enlargement; corolla purplish; stems usually puberulent; anther-sacs usually glabrous.....*P. penstemon*.
4. Corolla-tube gibbous above the point of enlargement; corolla white or purplish; stems usually glabrous; anther-sacs barbate usually...*P. digitalis*.

1. **Penstemon penstemon** (L.) Britt. Tall Purplish Beard-tongue.

Usually puberulent, the inflorescence glandular-pubescent, 2-3 ft. high. Leaves 3-6 in. long, the lower ones narrowed into margined petioles, the upper ones sessile or slightly clasping, acute, oblong or lanceolate, denticulate. Inflorescence usually a many-flowered, open thyrus; corolla purple or purplish, $\frac{5}{8}$ - $\frac{7}{8}$ in. long. Anther-sacs usually glabrous. In fields and thickets. May-July. General.

2. **Penstemon digitalis** (Sweet) Nutt. Foxglove Beard-tongue.

Usually glabrous, 2-5 ft. high, the inflorescence glandular-pubescent. Leaves 2-8 $\frac{1}{2}$ in. long, the lower and basal ones oblong or oval, narrowed into margined petioles, the upper ones sessile or clasping, lanceolate or ovate-lanceolate. Inflorescence a many-flowered, open thyrus; corolla white or purplish, 1-1 $\frac{1}{4}$ in. long, the limb somewhat 2-lipped, the throat open. Anther-sacs usually barbate. In fields and thickets. May-July. General.

This is not very definitely separated from the preceding species, and possibly does not deserve specific rank. Specimens collected from the same limited area show smooth stems and barbate anther-sacs, puberulent stems and glabrous anther-sacs, and puberulent stems and barbate anther-sacs.

3. **Penstemon hirsutus** (L.) Willd. Hairy Beard-tongue.

Stems slender, erect, sometimes tufted, downy-hirsute and more or less glandular to the base, frequently purplish, 1-3 ft. high. Leaves puberulent or glabrous, denticulate or the uppermost entire, the basal ones oblong or ovate, narrowed into petioles, the upper ones oblong to lanceolate, sessile or slightly clasping. Inflorescence thyrusoid, rather loose, glandular-pubescent; corolla purplish or violet, about 1 in. long, the tube gradually dilated above, the throat nearly closed by the villous palate. In dry woods and thickets, also on exposed limestone cliffs. May-July. General.

4. **Penstemon cobraea** Nutt. Cobaea Beard-tongue.

Stem stout, densely and finely pubescent below, glandular-pubescent above, 1-2 ft. high. Leaves firm, oblong to ovate, 3-5 in. long, mostly sharply serrate, the lower ones mostly glabrous with margined petioles, the upper ones sessile or cordate clasping, usually pubescent. Thyrus short, several-many-flowered; flowers about 2 in. long; corolla dull reddish-purple or paler, puberulent without, glabrous within, its tube narrow up to the top of the calyx, then abruptly dilated and campanulate, the limb slightly 2-lipped, the lobes short, rounded, and spreading. Capsule ovoid, acute, pubescent. On prairies. May-July. Lake County.

5. **Penstemon grandiflorus** Nutt. Large-flowered Beard-tongue.

Glabrous and somewhat glaucous with stout stem, 2-4 ft. high. Leaves thickish, entire, the basal ones obovate, narrowed into broad

petioles, the lower stem-leaves sessile, oval or oblong, 1-2½ in. long, the upper stem-leaves nearly orbicular, cordate-clasping, shorter. Thyrsus open, the bracts leaf-like, orbicular, cordate; flowers 2 in. long; corolla lilac or lavender-blue, the tube rather abruptly dilated above the calyx, the limb somewhat 2-lipped. Capsule acute, considerably longer than the calyx. On prairies, especially on flood-plains. Hamilton County.

3. *Chelone* (Tourn.) L. Turtlehead.

Glabrous perennials, with opposite, serrate leaves, and large white, red, or purple flowers in dense, terminal and axillary spikes or spike-like racemes. Calyx of five distinct sepals, subtended by sepal-like bracts. Corolla inflated-tubular, two-lipped, the upper lip arched, the lower densely pubescent, the two lateral lobes larger than the middle one. Andrecium with five stamens, included, the filaments bearded, four of the stamens didynamous, with densely woolly, heart-shaped anthers, the fifth sterile and shorter than the others. Seeds numerous, flattened, winged.

1. *Chelone glabra* L. Smooth Turtlehead.

A slender, erect, smooth-stemmed perennial, 1-3 ft. high. Leaves opposite, linear-lanceolate to ovate-lanceolate, 3-6 in. long, ½-1¼ in. wide, narrowed at the base into a short petiole; leaf margins serrate with sharp, appressed teeth. Flowers white, sometimes delicately tinged at the tips with pink, about 1 in. long, and very striking in appearance. In swamps, wet places, and along streams. July-September. Leaves used as medicine.

4. *Scrophularia* (Tourn.) L. Figwort.

Perennial, strong-scented herbs, ours with four-angled stems, usually with opposite leaves, and with small, green or yellow flowers in loose, terminal panicles or cymes. Corolla with a short, somewhat globular tube, the two upper and two lateral lobes erect, the lower one spreading or reflexed. Andrecium with five stamens, four anther-bearing and declined, the fifth one reduced to a sterile scale on the upper lip of the corolla. Seeds numerous, wingless, wrinkled.

1. Sterile stamen deep purple; corolla dull outside; panicle broad; petioles slender, scarcely margined.....*S. marylandica*.
1. Sterile stamen greenish-yellow; corolla shining outside; inflorescence narrowly elongated; petioles stout, evidently wing-margined.....*S. leporella*.

1. **Scrophularia marylándica** L. Maryland Figwort.

Perennial, glabrous below, somewhat glandular-pubescent above, with slender, 4-sided, grooved stem, 3-10 ft. high, and light green leaves, membranous, usually puberulent beneath, ovate or ovate-lanceolate, sharply serrate, long-petioled, 3-12 in. long, the petioles slender, scarcely margined. Flowers small, on pedicels $\frac{1}{8}$ -1 in. long, clustered on a long, nearly leafless, broad panicle. Corolla $\frac{1}{4}$ in. long, green, dull without, and brownish purple and shining within. Sterile stamen deep purple. Capsule subglobose with a slender tip. In woods and thickets. July-September. General.

2. **Scrophularia leporélla** Bickn. Hare Figwort.

Simple or somewhat branched perennial, 3-8 ft. high, with sharply 4-angled stem with flat sides, the lower part of the plant puberulent, the upper part viscid-glandular. Leaves ovate to lanceolate, narrowed at the base or sometimes subcordate, glabrous on both sides when mature, usually incised-dentate, 2-10 in. long, short-petioled, the petioles evidently wing-margined. Flowers $\frac{3}{8}$ - $\frac{1}{2}$ in. long, in a narrow, elongated panicle. Corolla green to purple, shining without, dull within. Sterile stamen greenish-yellow. Capsule ovoid-conic. In woods and along roadsides. May-July. Cuyahoga, Ashtabula, and Belmont Counties.

5. **Collinsia** Nutt. Collinsia.

Winter-annual or biennial herbs, with opposite or verticillate leaves. Flowers blue, white, pink, or variegated, verticillate or solitary in the axils. Corolla two-lipped, the upper lip two-cleft, the lobes erect or recurved, with a slight palate; the lower one three-cleft, the middle one conduplicate, enclosing the four stamens and filiform style. Vestigial stamen gland-like, short, with a green tip. Seeds few, large.

1. **Collinsia vérna** Nutt. Blue-eyed-Mary.

A slender, branching herb, with weak stem, 6 in.-2 ft. high, glabrous or puberulent. Leaves opposite or verticillate, the lower broadly ovate or orbicular, obtuse, rounded, narrowed, or subcordate at the base, crenate or entire, slender-petioled, the upper ones sessile or clasping, 1-2 in. long, ovate or oblong. Corolla slightly pubescent within, the upper lip white, with a slight, purple-spotted palate, the lower one dark blue or sometimes nearly white, with scattered hairs on the outside. Upper pair of stamens glabrous or nearly so, the lower pair pubescent below. Moist woods and hillsides. April-June. General.

6. **Paulownia** S. & Z. Paulownia.

A large tree, with broad, opposite, entire or three-lobed, petioled leaves, superposed, axillary buds, prominent lenticels, and more or less diaphragmed pith. Flowers large, violet, in

terminal panicles. Stamens four, didynamous, the lateral ones shorter, the fifth one absent. Capsule ovoid, acute. Seeds numerous, winged.

1. **Paulownia tomentosa** (Thunb.) Baill. Paulownia.

A tree, with thin, flaky bark, up to 70 ft. high, with a trunk diameter of 4 ft., and with broad, heart-shaped leaves, persistently pubescent beneath, 6-15 in. long, 4-8 in. wide, and long, often hollow petioles. Sepals 5, very thick and tomentose; corolla glandular-pubescent on the outside; ovary densely glandular-pubescent. May-July. Cultivated in Southern Ohio, and escaped in Lawrence County.

7. **Mimulus L.** Monkey-flower.

Erect or creeping, perennial herbs, with opposite, usually dentate leaves, and showy, pink, violet, or yellow, peduncled flowers, solitary in the axils, or raceme-like. Calyx prismatic, 5-toothed or lobed. Corolla tubular, 2-lipped. Stamens 4, didynamous, all anther-bearing. Capsule many-seeded, enclosed by the calyx.

1. Leaves sessile, clasping, prevailing lanceolate; peduncles considerably longer than the calyx..... *M. ringens*.
1. Leaves petioled, prevailing ovate; peduncles mostly shorter than the calyx..... *M. alatus*.

1. **Mimulus ringens L.** Square-stemmed Monkey-flower.

Perennial, glabrous plant, with erect, 4-sided, or somewhat 4-winged stem, often considerably branched, 1-3 ft. high. Leaves oblong or lanceolate, acuminate at the apex, clasping by a heart-shaped base, or the lower ones merely sessile, 2-4 in. long, $\frac{1}{2}$ -1 in. wide. Flowers solitary and axillary; peduncles considerably longer than the calyx; corolla 1-1 $\frac{1}{2}$ in. long, violet, or rarely white, with 2 yellow spots near the narrow throat, the upper lip erect, the lower spreading; calyx lobes lanceolate. In swamps, along streams, and in wet places. June-September. General.

2. **Mimulus alatus Soland.** Sharp-winged Monkey-flower.

Perennial, glabrous, similar to the preceding species, but with sharply 4-angled stem, the angles more or less winged. Leaves ovate, ovate-lanceolate, or oblong, narrowed at the base, petioled, 2-5 in. long, $\frac{3}{4}$ -1 $\frac{1}{2}$ in. wide; petioles $\frac{1}{4}$ -1 in. long. Calyx-lobes setaceous-tipped. Peduncles shorter than the calyx. In swamps and wet places. June-September. Rather general.

8. **Conoëbea Aubl.** Conoëbea.

Low, branching herbs, with opposite, pinnately-parted or serrate leaves, and small, blue or white flowers, solitary or two together in the axils. Calyx of 5, equal, linear sepals, free nearly to the base. Corolla 2-lipped. Stamens 4, fertile, didynamous, included. Anther-sacs parallel. Seeds numerous.

1. **Conobea multifida** (Mx.) Benth. Conobea.

A viscid-pubescent, diffusely spreading, much branched annual, 4-8 in. high. Leaves opposite, $\frac{1}{2}$ -1 in. long, pinnately-parted, the segments linear or linear-oblong. Flowers small, blue; corolla slightly longer than the calyx. Along streams and rivers. June-September. Hamilton, Greene, Madison and Ottawa Counties.

9. **Gratiola** L. Hedge-hyssop.

Low herbs inhabiting wet or damp places, with opposite, sessile, entire or dentate leaves. Flowers white or yellowish, peduncled, solitary and axillary, usually with two bractlets at the base of the calyx. Corolla more or less two-lipped. The two upper stamens fertile, the lower pair vestigial, minute, or sometimes represented by two slender, capitate filaments. Seeds numerous, striate.

1. Plant glabrous or nearly so; peduncles much shorter than the subtending leaf-bracts; corolla within throat pubescent with knobless hairs.
G. sphaerocarpa.
1. Plant glandular-puberulent; peduncles as long as or longer than the subtending leaf-bracts; corolla within throat pubescent with knobbed hairs.
G. virginiana.

1. **Gratiola sphaerocarpa** Ell. Round-fruited Hedge-hyssop.

Glabrous, ascending or erect, annual, simple or branched, 6-12 in. high. Leaves oblong or obovate-oblong, sessile, toothed, 3-5 nerved, narrowed at the base, 1-2 in. long, $\frac{1}{4}$ - $\frac{3}{4}$ in. wide. Peduncles stout, much shorter than the subtending leaf-bracts. Flowers small, the corolla tube yellow, the limb paler; corolla within throat pubescent with knobless hairs. Capsule globose. In wet places. June-September. Erie County. (*Gratiola virginiana* L., according to Pennell.)

2. **Gratiola virginiana** L. Clammy Hedge-hyssop.

Annual, stem glandular-puberulent above, widely branched, 3-12 in. high. Leaves oblong or oblong-lanceolate, sessile, narrowed at both ends, entire or sparingly toothed, 1-2 in. long, $\frac{1}{8}$ - $\frac{1}{2}$ in. wide. Peduncles slender, glandular, nearly as long as or longer than the subtending leaf-bracts. Corolla-tube yellowish; limb almost white; corolla within throat pubescent with knobbed hairs; sterile filaments minute or none. Capsule broadly ovoid, as long as the calyx. In wet places. May-October. General. (*Gratiola neglecta* Torr., according to Pennell.)

10. **Ilysanthes** Raf. False Pimpernel.

Small, smooth, annual or biennial herbs, with opposite, sessile, usually dentate leaves. Flowers small, purplish, peduncled, without bracts, solitary in the axils. Corolla two-lipped. The two upper stamens fertile, and included, the two lower ones sterile, two-lobed, the one lobe capitate and glandular, the other smooth and shorter. Seeds numerous, wrinkled.

1. Peduncles longer than the subtending leaf-bracts; calyx-segments shorter than the capsule.....*I. dubia*.
1. Peduncles shorter than the subtending leaf-bracts; calyx-segments as long as the capsule or longer.....*I. attenuata*.

1. ***Ilysanthes dūbia* (L.) Barnh.** Long-stalked False Pimpernel.

Stem square, at first simple and usually erect, later much branched and diffusely spreading, 3-10 in. long. Leaves ovate, obovate, or oblong, usually sessile, clasping, entire or sparingly toothed, $\frac{1}{2}$ -1 in. long. Corolla pale lilac, $\frac{1}{4}$ - $\frac{1}{2}$ in. long, the peduncles usually considerably longer than the subtending leaf-bracts; calyx-segments usually shorter than the capsule. In wet places. July-September. Meigs, Fairfield, Licking, Franklin, Huron, Auglaize, Defiance and Scioto Counties.

2. ***Ilysanthes attenuata* (Muhl.) Small.** Short-stalked False Pimpernel.

Stem square, erect or ascending, 3-16 in. long, the branches spreading. Leaves ovate, obovate, or oblong, $\frac{1}{2}$ -1 $\frac{1}{2}$ in. long, sparingly toothed. Corolla pale lilac to nearly white, $\frac{1}{8}$ - $\frac{1}{2}$ in. long; peduncles mostly shorter than the subtending leaf-bracts; calyx-segments as long as the capsule or longer. In wet places. May-October. Cuyahoga, Stark, Summit, Madison, Scioto, and Highland Counties.

The two species are evidently closely related as intermediates show peduncles longer than the subtending leaf-bracts, but with calyx-segments as long as the capsule.

11. ***Digitālis* (Tourn.) L.** Foxglove.

Tall, erect herbs, with alternate, entire or dentate leaves, and showy, yellow, purple, or white flowers in long, terminal, usually one-sided racemes. Calyx 5-parted. Corolla declined, slightly two-lipped, the tube contracted above the ovary, then abruptly inflated. Stamens four, didynamous, included. Seeds numerous, rugose.

1. Corolla purple to white, $1\frac{1}{2}$ -2 in. long; stem pubescent; leaves slender-petioled.....*D. purpurea*.
1. Corolla yellow, about $\frac{3}{4}$ in. long; stem smooth; leaves sessile.....*D. lutea*.

1. ***Digitalis purpurea* L.** Purple Foxglove.

Stout, erect, pubescent herb, usually biennial, 2-5 ft. high. Lower leaves ovate or ovate-lanceolate, 6-10 in. long, acute at the apex, narrowed at the base into petioles, dentate; upper leaves smaller, sessile. Racemes 1 ft. or more in length, dense, one-sided; flowers purple to white, $1\frac{1}{2}$ -2 in. long, drooping, the corolla spotted within; upper calyx-lobe narrower than the others. Escaped from cultivation. June-August. Cuyahoga and Lake Counties. From Europe.

Leaves of the second year's growth used officially as medicine.

2. *Digitalis lutea* L. Yellow Foxglove.

Glabrous perennial, 2-3 ft. high. Leaves oblong or lanceolate, denticulate, 4-4½ in. long, ¾ in. wide, ciliate only on the margin, sessile, narrowed at the base. Raceme many-flowered; corolla yellow to white, glabrous outside; calyx-segments lanceolate, acute. June-August. A waif in Cuyahoga County. From Europe.

12. *Azella* Gmel. Mullen Foxglove. (*Dasistoma* Raf., according to Pennell).

Erect herbs with opposite leaves, and yellow flowers solitary in the axils of leaf-like bracts. Corolla rotate-campanulate, the lobes nearly equal, and longer than the tube. Stamens 4, slightly unequal, not exserted; anthers glabrous; filaments short, villous; anther-sacs parallel and distinct. Seeds numerous, reticulated.

1. *Azella macrophylla* (Nutt.) Ktz. Mullen Foxglove.

Puberulent or glabrate, simple or sparingly branched, 4-6 ft. high, perennial by buds in the crown. Lower leaves long-petioled, pinnately-divided, 6-15 in. long, the segments dentate or pinnatifid; the upper leaves short-petioled or sessile, entire, 1-3 in. long. Flowers ½-¾ in. long, sessile and solitary in the axils of the upper leaves; calyx-lobes lanceolate or ovate; corolla yellow, 2-3 times as long as the calyx, the corolla-tube, except the lower part, very woolly inside. Capsule globose, pointed. In thickets, and along streams. August-October. General in western Ohio, as far east as Huron, Noble, and Vinton Counties. (*Dasistoma macrophylla* (Nutt.) Raf., according to Pennell.)

13. *Dasistoma* Raf. False Foxglove. (*Aureolaria* Raf., according to Pennell).

Large, erect herbs, more or less parasitic on the roots of other plants, with opposite, or whorled, or some alternate leaves, and large, showy, yellow flowers in terminal, usually leafy-bracted racemes. Calyx campanulate or turbinate, 5-lobed, the lobes sometimes foliaceous. Corolla funnel-form or campanulate-funnel-form, with five rather unequal, spreading lobes, the tube villous or pubescent within. Stamens 4, didynamous, included, villous or pubescent, the anther-sacs parallel and awned at the base. Capsule oblong, acute.

1. Leaves all toothed or pinnatifid. 2.
1. Leaves, at least the upper ones, entire. 3.
2. Plants, especially the stems, glaucous or glabrous; calyx and corolla glabrous outside; perennial. *D. virginica*.
2. Plants glandular-pubescent or hirsute; calyx and corolla pubescent outside; annual. *D. pedicularia*.
3. Plants pubescent; calyx pubescent outside. *D. flava*.
3. Plants glabrous; calyx glabrous outside; leaves all entire or the lower ones dentate. *D. laevigata*.

1. **Dasystoma virginica** (L.) Britt. Smooth False-Foxglove.

Glabrous and glaucous perennial with stout, usually branched stem, 3-6 ft. high. Leaves usually all petioled, the lower ones pinnatifid, 4-6 in. long, the upper ones pinnatifid or deeply incised. Flowers very striking; corolla pure yellow, glabrous outside, about 2 in. long, in leafy-bracted racemes. Capsule glabrous. In woods. July-September. Adams, Fairfield, Clarke, Cuyahoga, Fulton, and Wood Counties. (*Aureolaria flava* (L.) Farw., according to Pennell.)

2. **Dasystoma pedicularia** (L.) Benth. Fernleaf False Foxglove.

A much branched, leafy annual or biennial, 1-4 ft. high, more or less glandular and viscid. Upper leaves sessile, the lower ones usually petioled, pinnatifid, 1-3 in. long. Corolla 1-1½ in. long, pubescent outside; calyx-lobes foliaceous, usually pinnatifid or incised. Capsule pubescent. In dry woods and thickets. August-September. Fulton County. (*Aureolaria pedicularia* (L.) Raf., according to Pennell.) Our two specimens belong to the variety *A. ambigens* (Fern.) Farw., densely glandular-hirsute.

3. **Dasystoma flava** (L.) Wood. Downy False Foxglove.

Erect, usually simple, sometimes branched perennial, 2-4 ft. high, pubescent with a fine, grayish down. Leaves oblong, lanceolate, or ovate-lanceolate, usually opposite, entire, or the lower ones sinuate-dentate, or sometimes pinnatifid, 3-6 in. long, short-petioled, the upper ones much smaller and sessile, becoming bract-like. Corolla pure yellow, 1½-2 in. long, glabrous outside. Calyx and capsule pubescent. In dry woods and thickets. July-August. Eastern Ohio, as far west as Erie, Clarke and Adams Counties. (*Aureolaria virginica* (L.) Pennell.)

4. **Dasystoma laevigata** Raf. Entire-leaf False Foxglove.

Simple or sparingly branched perennial, 1-3 ft. high, glabrous or nearly so, but not glaucous. Leaves lanceolate or ovate-lanceolate, 1½-4 in. long, usually petioled, the upper ones entire, the lower ones dentate or incised. Corolla yellow, glabrous without, hairy within, 1-1¾ in. long, the limb fully as broad. Capsule glabrous. In dry thickets. July-August. Jackson, Adams, Vinton, Hocking, Fairfield, and Highland Counties. (*Aureolaria laevigata* (Raf.) Raf., according to Pennell.)

14. **Agalinis** Raf. Agalinis.

Erect, branching herbs, some shrubby, with opposite, entire, sessile leaves, and large, showy flowers in racemes or panicles, or solitary in the axils. Corolla slightly two-lipped, campanulate or funnelform, five-lobed. Stamens four, didynamous, included; filaments pubescent. Capsule ovoid or globose. Seeds numerous, mostly angled.

1. Pedicels shorter than or but slightly longer than the calyx; plants of moist ground.....2.
1. Pedicels much longer than the calyx, usually exceeding the corolla; plants of dry ground.....3.
2. Corolla $\frac{3}{4}$ - $1\frac{1}{4}$ in. long.....*A. purpurea*.
2. Corolla $\frac{1}{2}$ - $\frac{3}{4}$ in. long.....*A. paupercula*.
3. Plants leafy; leaves flat, linear to lanceolate, $\frac{1}{2}$ - $1\frac{1}{2}$ in. long; pedicels often shorter than the subtending leaf-bracts.....*A. tenuifolia*.
3. Plants very slender; leaves few and distant, filiform or with revolute margins, three-eighths to five-eighths in. long; pedicels usually longer than the subtending bracts.....*A. skinneriana*.

1. **Agalinis purpurea** (L.) Pennell. Large-flowered Agalinis.

Smooth or roughish annual, with slender stem, 1-2 $\frac{1}{2}$ ft. high, and with long, rigid, widely spreading branches. Leaves narrowly linear, usually widely spreading, 1-2 $\frac{1}{2}$ in. long, rarely with clusters in their axils, rough-margined. Flowers rose-purple or rarely white, $\frac{3}{4}$ - $1\frac{1}{4}$ in. long; pedicels shorter than or but slightly longer than the calyx; corolla much expanded above, often downy, the lobes all spreading. Capsule globose. In low ground, moist fields and meadows. August-October. Rather general.

2. **Agalinis paupercula** (Gr.) Britt. Small-flowered Agalinis.

Annual, glabrous or nearly so, 6-18 in. high, the whole plant very similar to the preceding species, but smaller, apparently intergrading with it. Leaves narrowly linear, $\frac{1}{2}$ -1 in. long. Corolla rose-purple, the lobes all spreading, $\frac{1}{2}$ - $\frac{3}{4}$ in. long. Capsule globose-oblong. In bogs and low meadows. July-September. Stark, Ottawa, Logan, Champaign, and Gallia Counties.

3. **Agalinis tenuifolia** (Vahl.) Raf. Slender Agalinis.

Glabrous annual with slender stem, 6-24 in. high; plant very leafy. Leaves flat, linear to lanceolate, acute, $\frac{1}{2}$ - $1\frac{1}{2}$ in. long. Flowers light rose-purple, spotted, rarely white, $\frac{5}{8}$ - $\frac{3}{4}$ in. long, the two upper lobes ascending over the stamens and style; pedicels often shorter than the subtending leaf-bracts. Capsule globose or slightly obovoid. In dry woods and thickets. August-October. General. Our specimens include both the typical form and *A. tenuifolia macrophylla* (Hook.)

4. **Agalinis skinneriana** (Wood) Britt. Skinner's Agalinis.

Very slender, roughish annual, 6-18 in. high. Leaves few and distant, $\frac{3}{8}$ - $\frac{5}{8}$ in. long, filiform or with revolute margins, commonly erect and appressed. Corolla light rose-purple or white, up to $\frac{1}{2}$ in. in length; pedicels usually longer than the subtending leaf-bracts. Capsule oblong. In dry, sandy woods and thickets. August-October. White-flowered form from southeastern part of Fulton County.

15. **Otophylla** Benth. Otophylla.

Annual, hirsute-pubescent herbs, with opposite, sessile, entire or pinnately-divided leaves, all or some of them auricled at the base. Flowers purple or white in terminal spikes.

Corolla-tube broadly dilated at the throat; lobes spreading. stamens four, didynamous, included; filaments glabrous or nearly so; anthers awnless, those of the shorter stamens much smaller than the others. Seeds angled.

1. **Otophylla auriculàta** (Mx.) Small. Auricled Otophylla.

Rough-hairy annual, with slender and usually simple stem, 1-2 ft. high. Leaves 1-2 in. long, lanceolate or ovate-lanceolate, acuminate at the apex, sessile, the lower leaves usually entire, the others entire but commonly with a short, oblong-lanceolate lobe on each side at the base. Flowers solitary in the upper axils, purple, sessile, about $\frac{3}{4}$ in. long, densely puberulent outside, glabrous within. Filaments glabrous or sparingly hairy; anther-sacs very unequal. In moist, open soil, low grounds, and prairies. July-September. Ottawa County.

16. **Búchnera** L. Blue-hearts.

Erect, hispid or scabrous perennials or biennials, mostly with opposite leaves and large, white, blue, or purple flowers in dense, terminal, bracted spikes. Corolla salverform; tube somewhat curved; lobes five, somewhat unequal, spreading. Stamens four, didynamous, included; anther-sacs confluent. Capsule oblong. Seeds numerous, reticulated.

1. **Buchnera americana** L. Blue-hearts.

Perennial; stem slender, stiff, hispid and rough, 1-2½ ft. high. Leaves prominently veined, usually all opposite, the lower ones obovate or oblong, obtuse, narrowed into short petioles or sessile, sparingly and coarsely toothed, the upper ones lanceolate or linear-lanceolate, entire or nearly so. Spike peduncled, 6-10 in. long in fruit; flowers mostly opposite, about 1 in. long; subtending bractlets shorter than the calyx; corolla purple, its lobes obovate, obtuse. Capsule oblique, a little longer than the calyx. In sandy or gravelly soil. June-September. Fulton County.

17. **Leptándra** Nutt. Culver's-root. (**Veronicastrum** Heist.)

Tall, erect, perennial herbs, with verticillate or opposite leaves. Flowers small, blue or white, in dense, spike-like racemes. Calyx 4-parted. Corolla tubular or salverform, four-lobed, only slightly two-lipped. Stamens two, much exserted. Seeds numerous, oval, minutely reticulated.

1. **Leptandra virginica** (L.) Nutt. Culver's-root.

Perennial, with simple, erect stem, 2-7 ft. tall, glabrous or nearly so. Leaves verticillate, or some of the uppermost opposite, lance-shaped, finely serrulate, 3-6 in. long, $\frac{1}{2}$ -1 in. wide. The small, white or nearly white flowers are in dense, spike-like racemes, 3-9 in. long. In woods, thickets, and open places. June-September. General. (**Veronicastrum virginicum** (L.) Farw.) Rhizome and roots used officially as medicine.

18. *Verónica* (Tourn.) L. Speedwell.

Chiefly herbs, with small, blue, pink, or white flowers, in terminal or axillary racemes or spikes, or solitary in the axils. Calyx usually four-parted, sometimes five-parted. Corolla wheel-shaped, the tube short, four-lobed, rarely five-lobed, the lower lobe commonly the narrowest. Stamens two, exserted, divergent, the anther-sacs confluent at the apex. Capsule flattened, obtuse or notched at the apex. Seeds numerous, smooth or rough.

1. Flowers in axillary racemes, their bracts small. 2.
1. Flowers solitary in the axils, the subtending bracts leaf-like and similar to the leaves, usually becoming smaller toward the top. 8.
2. Calyx 4-parted. 3.
2. Calyx 5-parted, the upper point small, all the sepal points with bristles; leaves ovate to lanceolate, sessile; racemes compact and showy. *V. leucurium*.
3. Plants hairy; leaves ovate to obovate; species of dry soil. 4.
3. Plants glabrous or minutely glandular; if hairy, then the leaves linear or linear-lanceolate; species of low ground and brook margins, or aquatic. 5.
4. Stem pubescent in 2 lines; leaves ovate, pointed; pedicels longer than the calyx. *V. chamaedrys*.
4. Stem hairy all over; leaves oval or obovate; pedicels shorter than the calyx. *V. officinalis*.
5. Leaves all short-petioled. *V. americana*.
5. Leaves sessile and clasping, or only the upper or lowermost petioled. 6.
6. Leaves ovate-oblong or oblong-lanceolate. *V. anagallis-aquatica*.
6. Leaves lanceolate to linear. 7.
7. Leaves linear or nearly so, three-eighths to five-eighths in. wide; pedicels not glandular; capsule much wider than long, strongly 2-lobed. *V. scutellata*.
7. Leaves lanceolate, broadest near the base, or the lowest elongated, lanceolate, clasping, five-eighths to one in. wide; rachis and pedicels sparsely pubescent with glands; capsule broad, globose, emarginate. *V. glandifera*.
8. Pedicels shorter than the subtending bracts. 9.
8. Pedicels longer than the subtending bracts. 11.
9. Corolla white or pale blue, sometimes streaked with dark blue; leaves of the oblong type, glabrous or short-pubescent; calyx and bracts glabrous or slightly short-pubescent. 10.
9. Corolla dark blue; leaves of the ovate type, 5-7 palmately nerved; long glandular-pubescent, including the bracts and calyx; annuals. *V. arvensis*.
10. Pedicels equalling the calyx; stem glabrous or pubescent; flowers in narrow racemes, more or less peduncled, the bracts becoming abruptly smaller than the uppermost foliage leaves; perennials. *V. serpyllifolia*.
10. Pedicels much shorter than the calyx; stem glabrous or short-pubescent; corolla white or very pale blue; annuals. *V. peregrina*.
11. Sepals not heart-shaped at maturity, prominently veined; leaves of the ovate or oblong type; rather short petioles; leaves crenately cut-toothed, 12.
11. Sepals heart-shaped at maturity, without prominent veins; leaves of the orbicular type or very broad, 3-5 lobed or 3-5 crenate; rather long petioles. *V. hederæfolia*.
12. Corolla not longer than the calyx. *V. agrestis*.
12. Corolla longer than the calyx. *V. tournefortii*.

1. **Veronica teucrium** L. Germander Speedwell.

Pubescent perennial, with erect stem, up to 20 in. high. Leaves ovate to linear-lanceolate, nearly entire, crenate to even bluntly dentate-incised, mostly sessile. Racemes opposite, elongated, many-flowered; flowers large, blue or violet, rarely rose or white; calyx-segments oblong-linear to lanceolate. Capsule obovate. Rare in grass or waste land. August. Medina County. From Europe.

2. **Veronica chamaedrys** L. Bird's-eye Speedwell.

Simple or branched perennial, with slender, ascending stem, pubescent in 2 lines, 4-12 in. high. Leaves ovate, sessile or nearly so, pubescent, truncate, rounded, or cordate at the base, incised-dentate, obtuse at the apex, $\frac{1}{2}$ - $1\frac{1}{4}$ in. long. The loose racemes, 2-6 in. long, are long-peduncled, 10-20 flowered, and either in opposite or alternate axils; flowers light blue or violet-blue, about $\frac{3}{8}$ in. broad; pedicels longer than the calyx, and usually longer than the subtending bractlets. Capsule obcordate, narrowed at the base. In fields and waste places. May-July. Lake County. From Europe.

3. **Veronica americana** Schwein. American Speedwell.

Glabrous perennial, at first decumbent, later erect and branching, rooting at the lower nodes, 6 in.-3 ft. long. Leaves oblong or oblong-lanceolate, short-petioled, sharply serrate, truncate, rounded, or subcordate at the base, 1-3 in. long, $\frac{1}{4}$ -1 in. wide. Racemes loose, elongated, sometimes 6 in. long, usually 10-25 flowered, peduncled, and in most of the axils; bractlets shorter than the pedicels; flowers blue or nearly white, usually striped with purple. Capsule nearly orbicular, compressed. In brooks and swamps. Plant emersed. April-October. General.

4. **Veronica anagallis-aquatica** L. Water Speedwell.

Perennial, with stout stem, glabrous or glandular-puberulent above, erect or decumbent, usually branched, often rooting at the lower nodes, 1-3 ft. high. Leaves of the sterile, autumnal shoots orbicular to obovate, serrulate, narrowed into margined petioles; leaves of the flowering stems lanceolate to oblong, $1\frac{1}{2}$ -4 in. long, $\frac{1}{4}$ -2 in. wide, sessile and more or less clasping, or the lowest ones short-petioled, finely serrate or nearly entire. Racemes 2-6 in. long, peduncled; flowers blue, often purple-striped. Capsule nearly orbicular, 2-lobed. In brooks and swamps. May-September. Butler, Champaign, Auglaize, Lucas, Erie, Miami, Clark, and Highland Counties.

5. **Veronica scutellata** L. Skullcap Speedwell.

Perennial, usually glabrous, sometimes pubescent or hairy. Stem slender, decumbent or ascending, leafy, simple or branched, 6 in.-2 ft. high. Leaves sessile, slightly clasping, linear or linear-lanceolate, remotely denticulate, $1-3\frac{1}{2}$ in. long, $\frac{1}{8}$ to nearly $\frac{1}{2}$ in. wide. Racemes axillary, equalling or longer than the leaves; peduncles slender; flowers small, blue, scattered, on very slender, spreading pedicels; bractlets shorter than the pedicels. Capsule much wider than long, strongly

2-lobed. In brooks and swamps. May–September. Cuyahoga, Ottawa, Erie, Perry, Lucas, Crawford, Licking, and Franklin Counties.

6. ***Veronica officinalis* L.** Common Speedwell.

Pubescent perennial, with prostrate but finally erect stem, 3–12 in. high. Leaves oblong, oval, or obovate, $\frac{1}{2}$ –2 in. long, obtuse, serrate, narrowed at the base into short petioles. Racemes spike-like, narrow, dense, elongated, and axillary, much longer than the leaves; bractlets longer than the pedicels; flowers pale blue, striped with violet. Capsule obovate-cuneate. In dry fields and on hills. May–August. General and abundant. In colonial times grown as a medicinal plant.

7. ***Veronica serpyllifolia* L.** Thyme-leaf Speedwell.

Perennial, glabrous or puberulent, with slender, branching stem, 2–10 in. high. Leaves oval, ovate, or oblong, crenulate or entire, short-petioled, or the uppermost sessile. Flowers in short, narrow, loose racemes, at the end of stem or branches; bractlets leaf-like, becoming abruptly smaller than the uppermost leaves; pedicels shorter than the bracts; corolla whitish or blue, with deeper stripes. Capsule rounded, obcordate or emarginate at summit, broader than high. Fields, lawns, roadsides, and thickets. April–August. General.

8. ***Veronica peregrina* L.** Purslane Speedwell.

Erect, glabrous or glandular-puberulent, branching annual, 3–13 in. high. Leaves oblong, oval, linear, or only slightly spatulate, $\frac{1}{4}$ – $\frac{3}{4}$ in. long, the lowest ones opposite, sessile, usually denticulate, the upper ones alternate, sessile, mostly entire, longer than the flowers. Flowers solitary, axillary, usually white or very pale blue; pedicels shorter than the calyx. Capsule nearly orbicular, usually a little shorter than the calyx, glabrous. Waste and cultivated grounds, in damp soil. May–October. General. Our specimens include the glandular-pubescent form. ***V. peregrina xalapensis* (H. B. K.) Pennell.**

9. ***Veronica arvensis* L.** Field Speedwell.

Simple or diffusely-branched, pubescent annual, 3–11 in. long. Lower leaves opposite, oval or ovate, crenate, the lowest ones petioled, the uppermost sessile, alternate, ovate or lanceolate, commonly entire. Flowers small, dark blue, solitary in the axils; pedicels shorter than the calyx. Capsule broadly obovate, obcordate. Fields, lawns, and woods, and cultivated soil. March–September. General. From Europe.

10. ***Veronica agrestis* L.** Garden Speedwell.

Slender, pubescent annual, with creeping or procumbent stem, 3–8 in. long, and ascending or spreading branches. Leaves broadly ovate, obtuse at the apex, truncate or subcordate at the base, crenate, short-petioled, the lower ones opposite, the upper ones alternate. Flowers small, blue, solitary in the axils, long-peduncled, the peduncles equalling or longer than the leaves. Corolla not longer than the calyx. Capsule broader than high, not very flat, narrowly emarginate at the summit. In fields and waste places. May–September. Hamilton, Montgomery, and Franklin Counties. From Europe.

11. **Veronica tournefortii** Gmel. Tournefort's Speedwell.

Diffusely-branched, pubescent annual, 6-18 in. long. Leaves oval or ovate, short-petioled, crenate-dentate, $\frac{3}{8}$ -1 $\frac{1}{8}$ in. long, the lower ones opposite, the upper ones alternate. Flowers blue, comparatively large, on slender peduncles, solitary in the axils of the upper leaves; peduncles as long as or longer than the leaves; petals exceeding the sepals. Capsule twice as broad as high, with a wide, shallow indentation at the summit. In waste places. May-September. Madison, Franklin, Jefferson, Lorain, Cuyahoga, Lake, and Belmont Counties. From Europe.

12. **Veronica hederaefolia** L. Ivy-leaf Speedwell.

Slender, diffusely-branched, pubescent annual, 3-18 in. long. Leaves broadly cordate, 3-5 lobed, 3-5 crenate, petioled, $\frac{1}{4}$ -1 in. wide, the lower ones opposite, the upper ones alternate. Flowers small, blue, axillary, peduncled, the peduncles often longer than the leaves; corolla scarcely longer than the calyx; sepals densely ciliate, becoming heart-shaped at maturity. Capsule only slightly 2-lobed, scarcely notched at the apex, but little compressed. In thickets, fields, and waste places. Erie and Hamilton Counties. From Europe.

19. **Synthyris** Benth. Synthyris.

Perennial herbs, with simple, erect stems and a thick rhizome, with alternate leaves, the basal leaves large and petioled, the upper stem leaves smaller, sessile or partly clasping and bract-like. Flowers small, pink, purple, or greenish-yellow, in dense, elongated spikes or racemes. Corolla 2-4-lobed or cleft, or sometimes wanting. Stamens two, sometimes four, exserted; anther-sacs parallel or divergent. Seeds numerous, flat, oval or orbicular.

1. **Synthyris bullii** (Eat.) Heller. Bull's Synthyris.

Pubescent perennial, with a stout stem, 1-2 $\frac{1}{2}$ ft. high. Basal leaves ovate or orbicular, rounded at the apex, truncate or cordate at the base, crenulate, 2-5 in. long, 5-7 nerved, with petioles usually shorter than the blades; stem leaves small, crenulate, sessile or slightly clasping, gradually becoming smaller. Inflorescence a dense spike, elongating in fruit; flowers small, greenish-yellow; the corolla, if present, commonly 2-lobed. Capsule emarginate, slightly exceeding the calyx. On dry prairies. May-July. Montgomery County.

20. **Pedicularis** (Tourn.) L. Lousewort.

Erect herbs, with pinnately-lobed, cleft, or pinnatifid leaves, and rather large flowers in spikes or spike-like racemes. Corolla strongly two-lipped, the upper lip arched, laterally compressed and often beaked at the apex, enclosing the four didynamous stamens. Anther-sacs similar and parallel. Ovules and seeds numerous.

1. Leaves partly opposite; leaf-blades deeply toothed or somewhat pinnatifid; upper lip of corolla truncate. Aug.-Oct. *P. lanceolata*.
1. Leaves scattered; leaf-blades pinnately-parted; upper lip of corolla with 2 lateral teeth. Apr.-June. *P. canadensis*.

1. ***Pedicularis lanceolata* Mx.** Lanceleaf Lousewort.

A stout, erect, usually simple perennial, 1-3 ft. high, glabrous or nearly so. Leaves mostly opposite, lanceolate, or linear-lanceolate, 2-5 in. long, finely cut. Spikes short; calyx 2-lobed, with foliaceous margins; corolla pale yellow, about $\frac{3}{4}$ in. long. Capsule ovate, scarcely longer than the calyx. Swampy places. August-October. Rather general, but no specimens from south of Montgomery and Hocking Counties.

2. ***Pedicularis canadensis* L.** Wood Lousewort.

Pubescent or hirsute perennial, 6-18 in. high, with simple stem, commonly tufted, the whole plant more or less tinged with purple. Basal leaves clustered, 9-14 in. long, slender-petioled. Stem leaves scattered, 3-5 in. long, decurrent; leaves of the inflorescence gradually reduced to bracts. Flowers in short, terminal, dome-shaped spikes; calyx cleft on the lower side, with several tooth-like lobes on the upper side; corolla pale greenish-yellow, the upper lip tinged with brown or brownish-purple, $\frac{7}{8}$ -1 in. long. Inflorescence decidedly elongating in fruit, 5-12 in. long; capsule flat, about twice as long as the calyx. Hill-sides and thickets. April-June. General.

21. ***Castilleja*. Mutis.** Painted-cup.

Erect herbs, parasitic on the roots of other plants, with alternate leaves and usually brightly-colored, inflorescence bracts. Flowers in spikes or racemes. Calyx laterally compressed, deeply cleft above or also below. Corolla decidedly zygomorphic and two-lipped, the upper lip arched and enclosing the four didynamous stamens. The two lobes of the anther unequal, the outer attached to the filament at the middle, the inner one by its apex. Capsule ovoid or oblong, many-seeded.

1. ***Castilleja coccinea* (L.) Spreng.** Scarlet Painted-cup.

Annual or commonly biennial, villous-pubescent, rather slender plant, 1-2 ft. high. Stem leaves prominently parallel-veined, divided into 3-5 linear, obtusish segments, sessile; the basal leaves in a rosette, parallel-veined or some at least, with two prominent side ribs from the base, entire. Inflorescence bracts 3-5 cleft, the lower green, the upper ones orange-scarlet, very conspicuous. Corolla $\frac{3}{4}$ -1 in. long, greenish-yellow, the three lower lobes plicate. Ovary with a green gland and prominent protuberance at its base. Moist meadows and hillsides. May-July. Franklin, Knox, and Madison Counties.

22. *Melampyrum* (Tourn.) L. Cow-wheat.

Erect, branching, annual herbs with opposite leaves, and small flowers solitary in the axils or in terminal, bracted racemes. Calyx four-toothed, the two upper ones somewhat longer. Corolla two-lipped, the upper lip arched, compressed, enclosing the four didynamous stamens. Capsule flat, oblique, 2-4-seeded; seeds smooth.

1. *Melampyrum lineare*. Lam. Narrow-leaf Cow-wheat.

A delicate annual with a slender, puberulent, wiry, somewhat 4-sided stem, 6 in.-1½ ft. high. Leaves light green, opposite, short-petioled, the floral ones with bristle-pointed teeth near the base or entire, the lower ones lanceolate or linear-lanceolate to ovate, 1-2½ in. long, ¼ in. wide. Flowers about ½ in. long, short-peduncled; corolla white and yellow, puberulent. In dry woods and thickets. May-August. Lorain, Cuyahoga, Lake, Ashtabula, Geauga, Portage, and Hocking Counties.

23. *Antirrhinum* (Tourn.) L. Snapdragon.

Annual or perennial herbs, with mostly opposite, entire leaves, and large, showy flowers in terminal racemes or solitary in the upper axils. Corolla decidedly saccate or gibbous on the lower side, with a prominent palate closing the throat. Andrecium with four didynamous, anther-bearing stamens, included, the lateral pair longer, and a very minute, sterile, fifth stamen. Capsule many-seeded.

1. *Antirrhinum majus* L. Great Snapdragon.

Perennial, 1-3 ft. high, glabrous except near the inflorescence, which is usually more or less glandular-pubescent. Leaves lanceolate, linear, or oblong-lanceolate, entire, acute at both ends, short-petioled, 1-3 in. long. The flowers are of a variety of colors ranging from white, pale yellow, and pink, to very deep orange, brown, and purplish-red, 1-2 in. long, arranged in simple racemes, 3-12 in. long. Style and ovary covered with glandular hairs. The fifth or vestigial stamen very small and 2-lobed. Sparingly escaped from gardens. June-September. Madison and Highland Counties. From Europe.

24. *Linaria* (Tourn.) Mill. Toadflax.

Herbs, or somewhat shrubby plants, with alternate leaves, or the lower opposite or verticillate, and flowers in terminal, bracted spikes or racemes. Corolla two-lipped, usually spurred on the lower side, its throat nearly closed by the palate. Stamens four, didynamous, included. Seeds numerous, angled or rugose.

1. Flowers yellow, $\frac{3}{4}$ - $1\frac{1}{4}$ in. long; spur of corolla subulate, nearly as long as the body..... *L. linaria*.
1. Flowers blue to white, $\frac{1}{4}$ - $\frac{1}{2}$ in. long; spur of the corolla filiform. *L. canadensis*.

1. ***Linaria linaria* (L.) Karst.** Yellow Toadflax.

A very common but beautiful perennial, with slender, erect, glabrous stems, sometimes glandular-pubescent above, and slightly glaucous, 1-3 ft. high. Leaves linear, pale green, entire, $\frac{1}{2}$ - $1\frac{1}{2}$ in. long, about $\frac{1}{8}$ in. wide, mostly alternate, but growing close together on the stems. Flowers pale yellow with darker spur and orange-colored palate, about $1\frac{1}{4}$ in. long, crowded in dense racemes. Capsule ovoid. Seeds rugose, winged. In fields and waste places. June-October. General, but no specimens from the north-western counties. From Europe. Commonly called Butter-and-Eggs. Used in medicine; flowers used as a dye.

2. ***Linaria canadensis* (L.) Dum.** Blue Toadflax.

Glabrous biennial or annual, 6 in.- $2\frac{1}{2}$ ft. high, the flowering stems erect or ascending, the sterile shoots spreading or procumbent, and very leafy. Leaves linear or linear-oblong, $\frac{1}{4}$ - $1\frac{1}{4}$ in. long, $\frac{1}{8}$ in. wide, those on the sterile shoots usually opposite. Flowers blue or white, $\frac{1}{4}$ - $\frac{3}{8}$ in. long, in long, slender racemes; spur of corolla filiform, curved, as long as the tube or longer; palate white. Seeds angled, wingless. In dry or sandy soil. May-September. Richmond Township, Huron County.

25. ***Chaenorrhinum* (D. C.) Lange.** Toadflax.

Herbs, with alternate, usually entire leaves, and blue, violet, or white, axillary flowers. Corolla two-lipped, definitely spurred on the lower side, the throat not closed by the palate. Stamens four, didynamous. Capsule inequilateral, one carpel longer than the other. Seeds ovoid or cuneate, ribbed.

1. ***Chaenorrhinum minus* (L.) Lange.** Lesser Toadflax.

Annual, glandular-pubescent all over, often branched, 5-13 in. tall. Leaves linear-spatulate to linear, mostly obtuse, narrowed at the base, $\frac{1}{2}$ - $1\frac{1}{4}$ in. long. Flowers blue or bluish, about $\frac{3}{8}$ in. long, shorter than the pedicels; spur short and stout, much shorter than the body of the corolla. Capsule globose-ovoid. Waste grounds and ballast. August-October. Portage, Huron and Belmont Counties. From Europe.

26. ***Kickxia*.** Dum. Cancerwort.

Spreading or creeping herbs, with pinnately-veined, short-petioled leaves, and solitary, white, yellow, or variegated, axillary flowers. Corolla two-lipped, spurred on the lower side, the throat closed by the palate. Stamens four, didynamous. Seeds numerous, ovoid, mostly rough or tubercled.

1. Leaves cordate or rounded at the base, ovate-orbicular; corolla spur curved. *K. spuria*
1. Leaves hastate; corolla spur straight..... *K. elatine*.

1. **Kickxia spùria** (L.) Dum. Roundleaf Cancerwort.

Pubescent annual, with simple or branched, prostrate stems, 3 in.-2 ft. long. Leaves ovate-orbicular, entire, or sometimes dentate, cordate or rounded at the base, $\frac{1}{4}$ -1 in. long, with short petioles. Flowers small, solitary in the axils; peduncles very pubescent, often much longer than the leaves; corolla yellowish, the upper lip purple; spur curved; calyx-lobes ovate or cordate. Capsule subglobose, shorter than the calyx; seeds rugose, not winged. In waste places and ballast. June-September. Lake County. From Europe.

2. **Kickxia elatìne** (L.) Dum. Sharp-pointed Cancerwort.

Pubescent annual, with prostrate stems, usually branched, 6 in.-2 ft. long. Leaves $\frac{1}{2}$ -1 in. long, short-petioled, the apex acute, the base hastate or subcordate. Flowers small, solitary in the axils; peduncles glabrous, or somewhat hairy, filiform, usually longer than the leaves; calyx-lobes lanceolate, acute; corolla yellowish, purplish beneath; spur slender, straight. Capsule subglobose, shorter than the calyx; seeds wingless. In sandy waste places. June-September. Lake County. From Europe.

27. **Cymbalària**. Kenilworth-ivy.

Perennial, creeping herbs, with long-petioled, palmately-veined leaves, and solitary, long-peduncled, bluish, violet, or white flowers, in the axils. Corolla two-lipped, definitely spurred on the lower side, the throat nearly or quite closed by the palate. Stamens four, didynamous, included. Seeds numerous, small.

1. **Cymbalaria cymbalària** (L.) Wettst. Kenilworth-ivy.

A dainty perennial, with smooth, trailing stem, 3 in.-4 $\frac{1}{2}$ ft. long, often rooting at the nodes. Leaves reniform-orbicular, $\frac{1}{4}$ -.1 in. in diameter. Petioles usually as long or longer than the blade. Corolla pale lilac or white, streaked with purple, $\frac{1}{4}$ - $\frac{1}{2}$ in. long, the palate yellowish. In waste places and along roadsides. June-August. Montgomery, Crawford, Highland, Cuyahoga, Fulton Counties. From Europe.

28. **Calceolària** L. Calceolaria.

Tender herbs or shrubs, mostly with opposite leaves, a four-parted calyx, and a two-parted corolla, the two lips sack-shaped. Flowers in cymes or clusters. Andrecium with two stamens and no vestiges.

1. **Calceolaria crenatiflòra** Cav. Calceolaria.

Herbaceous, soft-hairy plant, with simple leaves; and yellow, variously-spotted flowers. Corolla 2 $\frac{1}{4}$ in. broad, 1 $\frac{3}{4}$ in. long. This species is apparently the main source of the more showy, herbaceous, garden varieties and hybrids. Cultivated.